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NUTRITIONAL STATUS OF WOMEN IN A SAGO-BASED FORAGING ENVIRONMENT IN EASTERN INDONESIA

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Introduction

Previous studies in Indonesia have indicated that Indonesians consume an average of 2,675 kcal/day (Soekirman et al. 1992: 8). In the province of Maluku, energy intake has been determined to be 2,180 kcal/day, while protein intake averaged 48.2 grams (Indonesia Membangun 1988: 417). The average energy intake is low, according to FAO/WHO recommendations (1974: 66, table 1), although protein is adequate. Previous studies have also indicated that 74% of pregnant women in Maluku have moderate to severe anemia (<11 g/dl; GOI-UNICEF 1988: 62).

Maluku is a region where sago is a staple food. Dietary studies that describe nutrient intake of sago-eating populations are not available in the published literature. Data on nutritional status are also limited. This study describes nutrient intake and nutritional status of women in Lohiatala, Kairatu District, Western Seram, a sago-based foraging society.

Methods

Data were gathered in the month of July 1994 in the village of Lohiatala, Kairatu District, Western Seram in collaboration with village leaders and health officials. The research was sponsored by Universitas Pattimura (Ambon) in collaboration with the University of Hawai'i (Honolulu).

An older woman between 20 and 49 years of age was selected from every household in the village. Each woman selected received one unscheduled visit from one of two trained interviewers who stayed with compliant women from 7 a.m. to 7 p.m. in order to weigh food intake and collect sociodemographic information. Forty-four women complied; 28 were unable to comply due to illnesses (3), shyness (6), work (9), or

absence at the time of the research (usually to the "old" village, N=10). Standard procedures for recording food weights were followed (Thompson and Byers 1994).

Anthropometric measures were taken the following day by another interviewer (FLN). These measures included weight, height, arm circumference, calf circumference, hip circumference, and triceps skinfold thickness. Anthropometric measures were taken according to standard procedures (Lohman, Roche, and Martorell 1988).

Data entry and analysis were conducted using the statistical software package EpiInfo (version 6.02) on an IBM microcomputer. Nutrient analyses were done using Nutritionist IV software (version 2, Oregon). Data on four local vegetables were added, as published by Hardinsyah and Biawan (1994)—*daun katuk, daun kumangi, daun ganemo* or *melinjo* and *kecipir buah muda*. Data on papaya flower and sago were taken from Mahmud et al. (1990).

Results

Sociodemographic

The mean age of the women was 34.5 (±7.9 years); 75% of women had completed primary school; and the mean income of households of the women studied was Rp 119,000 (±125,000) per month, or approximately US$54.00 (Table 1). Within the village, 43 percent of the women studied resided in Sion (N=19), 34 percent resided in Ebenheiser (N=15), and 23 percent resided in Immanuel (N=10). Sion was closer to the coast, Immanuel was toward the forest (inland), and Ebenheiser was in between.

Eleven percent of the women were pregnant, 25 percent were lactating, 77 percent were "usually ill." These illnesses included headache, muscle or body ache, dizziness, lack of appetite, and diarrhea. Many women believed that they had been infected with malaria.

Diet

The diet consisted primarily of sago, cassava, taro, rice, fish (fried in coconut oil), water, coffee, and sugar. Various leaves were gathered and consumed, usually with coconut cream. All households gathered food and wood in the forest. Sixty-four percent of the households hunted in

the forest to obtain part of their dietary intake. Hunted foods included wild pig, cuscus, and birds.

Table 1. Sociodemographic characteristics of women in Lohiatala (N=44)

CHARACTERISTIC	N	%
Education, yrs		
1–6 yrs	33	75
7–9 yrs	5	11
10–12 yrs	4	9
12+ yrs	2	5
Pregnant		
yes	5	11
no	39	89
Lactating		
yes	11	25
no	33	75
Village Sector of residence		
Sion	19	43
Immanuel	10	23
Ebenheiser	15	34
Usually ill		
yes	34	77
no	10	23
Hunt in forest		
yes	28	64
no	16	36

Looking at nutrient intake by age and reproductive status, it can be seen that younger women and pregnant and lactating women have lower intake of most nutrients than older, nonpregnant, nonlactating women (Tables 2 and 3). Calorie intake was adequate for nonpregnant, nonlactating women, but low for both pregnant and lactating women, relative to international recommendations for moderately active women. On the other hand, the vitamin C and calcium intake of pregnant and lactating women is higher than among nonpregnant, nonlactating women. Still, calcium intake is low for pregnant and lactating women relative to reference data. Other nutrients are consumed at adequate levels. Vitamin C is much higher than recommendations. The percentage of calories de-

rived from fat ranges from 34 (nonpregnant, nonlactating) to 41 percent (lactating).

Table 2. Mean (±S.D.) macronutrient intake by age and reproductive status of women (n=44) in Lohiatala, 1994.

VARIABLE	CALORIE (KCAL)	CARBOHYDRATE (GM)	PROTEIN (GM)	FAT (GM)
Age (years)				
19–24 (n=6)	1749.3±701.8	255.8±93.4	33.9±27.2	66.1±28.7
25–50 (n=38)	2354.2±1044.2	336.1±149.4	48.0±39.6	91.2±61.2
REPRODUCTIVE STATUS				
Pregnant (n=5)	1927.4±733.2	258.2±104.2	39.1±28.3	83.7±50.9
Lactating (n=11)	2078.0±1140	342.9±130.3	45.3±24.3	94.3±57.3
Nonpregnant/ nonlactating (n=28)	2284.0±1094.1	330.1±156.6	47.6±44.4	85.9±61.4

Table 3. Mean (±S.D.) micronutrient intake by age and reproductive status of women (n=44) in Lohiatala, 1994.

VARIABLE	VITAMIN C (MG)	THIAMINE (MG)	IRON (MG)	CALCIUM (MG)
AGE (YEARS)				
19–24 (n=6)	281.8±96.1	0.56±0.21	9.5±5.7	471.0±194.4
25–50 (n=38)	300.2±195.6	0.91±0.57	15.3±9.6	597.0±292.0
REPRODUCTIVE STATUS				
Pregnant (n=5)	299.0±89.6	0.91±0.65	12.7±6.4	589.0±148.2
Lactating (n=11)	333.2±161.1	0.74±0.25	13.5±4.6	588.3±236.8
Nonpregnant/ nonlactating (n=28)	283.5±206.5	0.90±0.61	15.2±11.1	574.8±320.7

Anthropometry

Anthropometric data are presented in Table 4. Women are somewhat below reference values for all measurements except the triceps fatfold.

Multiple regression analyses showed years of education to be positively related to height and hunting in the forest to be negatively so; while the same variables were both positively associated with body mass index (Table 5). Residence in Immanuel sector and breastfeeding were positively associated with energy intake.

Table 4. Anthropometric measures (N=44) in Lohiatala, 1994

MEASURE	MEAN	S.D.	RANGE	PERCENT OF REFERENCE VALUE†
Age-yrs	34.5	7.861	20–46	N/A
Weight-kg*	47.4	7.606	25–62.0	78
Height-cm	153.2	4.168	145.5–162	94
BMI (kg/m^2)*	20.3	2.965	11.7–27.2	89
Arm Circum.-cm	25.6	2.526	21–32.3	90
Calf Circum.-cm	31.8	2.671	20.5–37.0	N/A
Hip Circum.-cm	88.8	5.678	77.0–103.4	N/A
Triceps Skinfold-mm	22.6	7.403	7.0–44	100

*Excluded pregnant women, N=39
†Fiftieth percentile (Frisancho 1990)

Discussion

Pregnant and lactating women may be at risk for nutritional problems, based on dietary intakes assessed. Further exploration into cultural reasons for lower intake during pregnancy and lactation is needed.

The relatively high dietary fat intake and high triceps fatfold also warrant further study. The dietary fat comes primarily from coconut. Whether fat derived from coconut results in greater fat storage than fat derived from other sources is an intriguing question. Total energy intake was not high, yet the percentage of calories from fat and tricep fat storage were relatively high compared to other populations (Frisancho 1990).

Height is a measure that, when observed on a population or epidemiologic basis, indicates long-term or chronic nutritional status, because growth occurs only after energy needs are met. Therefore, adult height gives a picture of nutritional history.

Variables associated with height were education, illness, and household hunting in the forest. Higher education was associated with greater height, while illness and hunting were associated with lesser height. In contrast, the body mass index ($weight/height^2$), which reflects current nutritional status, was explained by education and household hunting, both of which were positive contributors to body mass. This suggests that, while those whose household hunts in the forest may have experienced calorie deficits in the past, coming from a household that hunts in the forest improves nutritional status at this point in time. Furthermore,

those from households that hunt in the forest had greater energy intakes, as did those who were breastfeeding.

Living in Ebenheiser sector was associated with greater height, while living in Immanuel sector was associated with greater energy intake. The latter sector is closer to the forest. Perhaps families who live there hunt more than those in other villagers.

Table 5. Multiple regression analysis of factors influencing nutritional status, Lohiatala (N=44)

Height (cm) - Past nutritional status - F=2.33, p<0.10

VARIABLE	B COEFFICIENT	PARTIAL F
Sector Immanuel residence (yes, no)	–3.77	0.22
Sector Ebenheiser residence (yes, no)	1.99	2.03
Breastfeeding (yes, no)	–1.19	0.02
Educational Level (2-5)	1.31	3.10
Hunts in forest (yes, no)	–2.99	4.86

Body Mass Index (weight, kg/height, m^2) - Current nutritional status F=2.35, p<0.10

VARIABLE	B COEFFICIENT	PARTIAL F
Sector Immanuel residence (yes, no)	-0.65	0.39
Sector Ebenheiser residence (yes, no)	-0.54	0.33
Breastfeeding (yes, no)	-0.68	0.54
Educational Level (2-5)	1.36	7.49
Hunts in forest (yes, no)	1.94	4.55

Energy Intake (kcal/day), weighed food record F=2.67, p<0.05

VARIABLE	B COEFFICIENT	PARTIAL F
Sector Immanuel residence (yes, no)	1056.05	6.84
Sector Ebenheiser residence (yes, no)	–16.76	0.00
Breastfeeding (yes, no)	739.95	4.21
Educational Level	155.33	0.65
Hunts in forest (yes, no)	400.00	1.29

It is possible that our study was conducted at a productive hunting season but that, on average, “hunters” suffer from lack of food, as is suggested by their shorter heights. It is also possible that the “hunters” represent a somewhat different ethnic group, which currently has a population norm whose women are shorter than others in the village. However, there was no evidence to support the latter theory; the villagers are

all mostly of Alune descent. More likely, the hunting reflects a somewhat different diet and other lifestyle patterns that are highly variable, such that, during hunting success, food intake exceeds that of other villagers, but with frequent periods of shortage. Items that are hunted provide protein, which is especially important for growth in height, but because these foods are frequently lacking, lower heights are achieved. Another explanation for the association of hunting with greater energy intake but shorter heights could be that the energy requirements among hunting households are greater than among other households, so that although dietary intake is higher, it is not high enough to meet requirements.

Further study of factors influencing dietary intake and nutritional status in Lohiatala would be important. Given movement of the village from the forest to the present site 30 years ago (Ng 1995: 25), the current village of Lohiatala could be considered a transistional subsistence economy (Eder 1984). The presence of a more recent nearby transmigration community, Waihatu, may also alter dietary patterns. Nonetheless, women in Lohiatala appear to be generally successful at meeting their nutrient requirements at this time.

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